UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**
JUNE 1950

EROSION CONTROL PRACTICES DIVISION

Case Study of the Soil Conservation Program for a Small Farm Called for - H. O. Anderson, LaCrosse, Wisconsin.-"The Regional Farm Management Committee of the Land Grant Colleges requested a case study of the soil conservation program for a small farm. To meet this request, the records for a small farm on which a case study report was prepared in 1942 was brought up-to-date. It is expected that this report will be completed in July. Criticisms of the manuscript on the Grant County farm were received from the cooperating agencies and this manuscript should be ready for duplication and distribution early in August."

Vetch Shows Promise in Nebraska - F. L. Duley, Lincoln, Nebraska.- "As a result of our work with vetch as an erosion control crop on this sandy land a considerable acreage has been seeded this year. Farmers are very much interested in its possibilities, both as a feed crop and for reducing soil blowing. Furthermore the Nebraska Crop Improvement Association is certifying some of this seed this year in the hope that a good supply of Nebraska-grown seed can be built up. Ten fields with a total of 186 acres have had the first field inspection for certification."

Progress Report on Soil and Water Conservation Research at the Red Plains Conservation Experiment Station - Harley A. Daniel, Guthrie, Oklahoma.-"Progress Report on Soil and Water Conservation Research at the Red Plains Conservation Experiment Station is given in Oklahoma Agricultural Experiment Station mimeographed Circular M-195. This report gives the results accumulated at this station.

"The most effective and practical methods of erosion control yet developed for growing cultivated crops probably include: A well planned system of terraces; contour cultivation; fertility treatments; and cropping systems. The exact combination of these practices, however, must be determined by the various soil capabilities and climatic conditions where they are applied.

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

"Rotations of cotton, wheat and sweet clover have been studied on the Red Plains Station during the past 20 years. It has reduced soil losses 74 percent and runoff water 34 percent annually as compared to continuous cotton. Both the wheat and sweet clover greatly reduced erosion but the amount of soil removed from the wheat plot was six times more than that from sweet clover.

"This experiment was started on virgin soil broken out of native grass sod in 1929. The yield of cotton in the rotation the first and second five-year periods was less than that on the continuous area. During the last 11 years, however, this rotation and small quantities of phosphate fertilizer has increased the yield of cotton 1.89 times. Another interesting fact about this experiment is that cotton production was increased 2.98 times the last five years of this period, and 3.11 times in 1948 and 1949. Winter covers of vetch and mineral fertilizers, have also doubled the yield of cotton during the last 18 years.

"Close-growing cultivated plants that produce protective land cover during the months of heavy rainfall are especially valuable in conserving soil and water. Sixty percent of the annual precipitation at this station was received during the months of April, May, June, August, and September; but an average of 77 percent of the total runoff water was lost in this period. July rainfall is usually low. Therefore, thickgrowing vegetation and other conservation measures are most useful during the spring and fall months. Fertilizers are especially valuable during these periods. They increase plant growth and produce a better land cover."

Different Methods Seeding and Covering Alfalfa Seeds - F. W. Schaller, Ames, Iowa.-"Alfalfa stand counts were made on plots comparing different methods of seedbed preparation for the establishment of grasses and legumes in western Iowa. The data show that when alfalfa was drilled in with the oats there was an average of only 4 plants per square foot. When all the seed was broadcast and disked in the alfalfa averaged 10 plants per square foot. In all the other treatments where the alfalfa seed was broadcast on a firm seedbed and covered lightly, 15 to 20 plants per square foot were present. Three methods of covering the seed were used, namely, harrowing, rolling and treading. There was no difference in stand due to the method of seed covering. In general, it appears that under very favorable growing conditions, deep covering of alfalfa seeds even in rather coarse textured loess soils results in a low number of plants which emerge and become established. If the soils had been dry during this period deeper seed covering may have appeared more favorable. Also, differences might have occurred as a result of using the harrow, roller or treader. This study will be continued."

Rainfall Intensity as a Factor in Soil and Water Conservation - O. R. Neal, New Brunswick, New Jersey.-"Within reasonable limits, soil and water losses are influenced more by rainfall intensity than by the amount of rain. A half-inch of rain falling in a high-intensity summer storm will often cause several times as much runoff and erosion as will an inch or more of rain falling at a lower intensity. During the past 10 years

at the Marlboro Station there have been 197 storms that caused some measurable amount of runoff and erosion. Of this number 22 storms, all occurring within the May to November period, have accounted for 41% of the water loss and 64% of the soil loss. Four storms out of this total accounted for 18% of the runoff and 31% of the erosion. These are the storms of relatively high intensity. On sandy Coastal Plain soils rain falling at a rate above 2.00 inches per hour, even for only a few minutes, will cause soil and water losses from unprotected areas. Rainfall at rates above 1.00 inch per hour for any extended period will cause losses from unprotected areas. Rain at a rate of less than 1.00 inch per hour does not commonly cause serious runoff or erosion.

"High intensity rainfall is not distributed evenly throughout the year, but occurs seasonally. During the past 10 years essentially all of the rain which exceeded an intensity of 1.00 inch per hour occurred during the May through November period. Most of this amount occurred during the May through November period. Most of this amount occurred during June through September. July has averaged more than 2.5 inches of rain at intensities above 1.00 inch per hour. June, August, and September have each averaged about 1.5 inches of rain at or above this rate. July has averaged about 1.5 inches of rain at a rate above 2.00 inches per hour. The other 3 months have averaged about 0.5 inch of rain above this rate.

"Soil and water losses follow the same seasonal pattern shown in rainfall intensity. Most of the total annual soil loss and a large part of the annual water loss occurs during the June through September period. This is true regardless of whether or not winter cover crops are grown. Winter cover is highly effective in reducing losses, as will be shown in a later discussion. The effectiveness occurs, however, more as a residual effect during the summer period when rainfall intensity is high, than as a protection during the winter period.

"A major portion of annual soil and water losses occur as a result of high-intensity storms. These storms ordinarily occur during the summer period, with July as the month of greatest erosion hazard. This fact should be considered in planning cropping systems and other conservation activities. It is much less dangerous, from the conservation standpoint, to have land bare and unprotected during spring or fall periods than during mid-summer. The construction of waterways, terraces, and other practices should be planned, to whatever extent is possible, so that this period of serious erosion hazard will be avoided."

Favorable Results with New Plow - G. R. Free, Marcellus, New York.- "Previous to this year our subsurface or stubble mulch plowing has been accomplished with an ordinary plow with moldboard removed. Crop yields have generally been less than those obtained with ordinary plowing. This year we are using an improvised arrangement which more closely stimulates turn plowing and yet leaves residues on the surface. The stand, height, and color of both corn and oats on seedbeds prepared with this new plow appeared as good at the end of June as on turn plowed seedbeds. Soil moisture data which have not been completely analyzed show slightly more moisture in the plots prepared with this new plow.

Erosion Yardsticks - "Those of us who have been close to the erosion problem for any length of time can see as we go along the highway much fresh and old erosion that the average person does not see at all. Many of the 'yardsticks' we use cannot be put in quantitative terms, and yet from plot measurements of erosion losses we know that considerable erosion can occur without rilling or gullying that can be seen from a distance. During the past few weeks thunderstorms in Central New York have produced rill patterns that could be seen for distances of a mile or more. Highway men have been out cleaning topsoil off the roads in many places, but little progress has been made on the job of cleaning our road ditches. Some fresh soil depositions in fields are a foot deep. The newspapers report some damage to 'crops'. Admittedly erosion of the kind that occurred is not spectacular news such as news of flood or drouth, but perhaps it would be if some 'yardsticks' were provided."

Recording Rain Gage for Evaporation Measurements - E. A. Carleton, Geneva, New York.-"A record of the evaporation from a water surface in the bucket of a recording rain gage was kept for the month. The gage was painted black outside. The bottom of the funnel was removed as for snow catchment. The depth of water in the bucket was kept at about one inch. The total loss for the month was 5.08 inches. Daily losses, mean temperature and weather observations are tabulated in the following table.

Date June	Loss	Mean Temp.	Weather	Date June	Loss	Mean Temp.	Weather
1	.14	54	Cloudy, rain .29	16	.17	65	Cloudy, rain .02
2	.20	72	Partly cloudy	17	.09	50	Cloudy, rain .06
3	.02	58	Cloudy, rain .76	18	.14	52	Fair
4	.23	54	Fair	19	.05	63	Cloudy, tr. rain
5	.23	65	Partly cloudy	20	.23	75	Partly cloudy
6	.26	69	Cloudy	21	.15	58	Fair
7	.26	75	Fair	22	.15	70	Fair
8	.25	77	Fair	23	.27	80	Fair, rain .20
9	.23	79	Fair, rain .42	24	.08	76	Cloudy, rain .92
10	.07	65	Cloudy, rain .03	25	.22	71	Cloudy
11	.18	56	Partly cloudy	26	.24	82	Fair
12	.19	65	Fair	27	.24	79	Cloudy
13	.12	67	Cloudy	28	.23	68	Fair
14	.04	58	Cloudy, rain .20	29	.05	68	Cloudy, rain .13
15	.15	68	Fair	30	.20	69	Fair

Total Loss = 5.08" Total Rainfall = 3.03".

Tobacco Planter and Shifter Developed for Contour and Ridge Planting - C. S. Britt, Beltsville, Maryland.-"Contour planting of tobacco with mechanical transplanters causes considerable trouble where slopes over 7 or 8 percent are involved. Uniform width rows are hard to obtain because the transplanter will slip down hill depending on the slope and soil condition. Where ridged rows are put up before planting, the plants must be planted on top of the ridges and no slipping can be tolerated.

"During the past winter we worked with Mr. G. A. Cummings of the Farm Machinery Division and designed and built a shifter lever for the swinging drawbar of a Farmall Super-A tractor. This shifter is operated by hydraulic power through the touch control levers. Thus, the planter can be pushed to the desired position and row width regulated without stopping work.

"With this shifter, a modified Iron Age transplanter was used to plant all of our tobacco plots with both ridged and flat rows. This same device was used by Mr. Calvert Norfolk, a cooperating farmer in the Calvert Soil Conservation District with very good results. Mr. Norfolk has both ridged and flat tobacco on the contour."

Winter Changes Soil Structure - C. S. Slater, Beltsville, Maryland.-"Volume weight measurements were made last fall and this spring in the surface 4 inches of tubs of soil that had been subjected to (a) a high water table, or (b) good drainage, over winter. Volume weights decreased during the winter with good drainage, increased over winter under the influence of a high water table. The measurements were replicated. The average percentage decrease in volume weight for the well drained tubs was about 4 per cent and the increase for the poorly drained tubs was about 3.5 per cent.

"A mulching experiment imposed on the above tubs shows that the water-stability of wet, unprotected soils deteriorates greatly during the winter. Mulch, or the absence of a high water table, prevented so great a deterioration in water-stability, as shown in the following table.

Over winter treatment	Water-Stability					
	Soil A		Soil B		Soil C	
	Fall	Spring	Fall	Spring	Fall	Spring
	%	%	%	%	%	%
Bare, well drained	94	92	88	89	88	86
Mulched, well drained	96	91	86	88	86	85
Mulched, poorly drained	92	85	89	77	85	73
Bare, poorly drained	95	54	88	38	87	48

Seed Yields from Annual Legumes that are being Tested for their Ability to Naturally Reseed the Area on Which Planted - E. C. Richardson, Auburn, Alabama.-"Several different possible reseeding legumes were planted on Norfolk loamy sand just south of Auburn and on Cecil sandy loam at Camp Hill, Alabama, in October 1949. Excellent stands were obtained of all plantings both at Camp Hill and Auburn and excellent growth was made.

"Seed yields were determined by cutting areas 1 square yard in size at several different places in each plot. Samples of legumes containing seed were dried, threshed, and weighed. Yields of seed from crimson clover and bur clover were recorded as rough seed. After threshing to remove the bur, yields were recorded as clean seed. In cases of crops like hairy peas and the vetch, the yields of rough and clean seed were the same. Results are shown in the following table.

Yields of rough and clean legume seed at Auburn and Camp Hill, Alabama

CROP	SEED YIELDS - CAMP HILL		SEED YIELDS - AUBURN	
	Rough	Clean	Rough	Clean
Ball clover	2,057	.360		
Hairy peas	1,492	1,492	1,129	1,129
Grandiflora vetch	665	665	605	605
Bur clover	214	43		
Crimson clover	1,936	418	2,823	513
Button clover	1,742	501	2,178	460
Subterranean clover	2,420	484	1,499	302
Smooth vetch	1,028	1,028	645	645
Woolly pod vetch	605	605		

"Maturity of seed from the various plants ranged from early April to late June. Bur clover was the first plant to mature seed. Crimson clover was the second crop to mature seed. It matured seed in late May. Hairy peas, smooth vetch, woolly pod vetch, and grandiflora vetch produced seed in early June. Subterranean clover, botton clover, and ball clover were the latest to mature seed. These crops matured in late June."

Stubble Mulch Studies - C. J. Whitfield, Amarillo, Texas.-"A measurement was made of the amount of straw remaining on the surface and incorporated with the soil of the plow layer of some of the stubble mulch plots. From 12 to 57 percent of the original amount of straw was found to remain on the surface, depending upon the type of tillage used. With the exception of the delayed subtilled fallow plot, which had been given but one cultivation, the plots had been tilled four times. From 37 to 76 percent of the original straw was accounted for in the two fractions.

Table 1.--Amount of residue on surface and incorporated with soil of plow layer of stubble mulch plots. June 20, 1950

TILLAGE	PLOW LAYER		SURFACE	
	Residue Lbs. per acre	Percent of Original straw	Residue Lbs. per ac.	Percent of Original straw
Hoeme fallow	714	20	1,415	39
Delayed subtilled fallow	1,183	20	3,290	56
Subtilled fallow	922	15	3,500	57
Oneweyed fallow	1,280	25	617	12

"Moisture samples taken on the stubble mulch plots on June 27 showed a sizeable increase in available moisture since the last sampling date on May 10. Larger increases occurred in the plots cultivated with the subtillage machine or the field cultivator than with the oneway plot.

Table 2.--Available water in inches in top 4 feet of soil of stubble mulch plots on May 10 and June 27, 1950

TILLAGE	AVAILABLE WATER - INCHES	
	May 10	June 27
Hoeme fallow	0.9	3.46
Delayed subtilled fallow	0.8	2.52
Subtilled fallow	0.9	2.39
Oneweyed fallow	0.9	1.58

Drought Resistance of Grasses - "During the 8 months period, October 1, 1949 through May 31, 1950 only 3.46 inches of precipitation (36 percent of normal) were received on the Amarillo Conservation Experiment Station. Of this total only about 15 percent was considered to be effective moisture. This dry fall, winter and spring period gave an excellent opportunity to observe the effect of drought (As a result of the drought and greenbugs no wheat was produced on wheat after wheat or wheat on fallow lands on the Amarillo Station and over much of the Southern High Plains. As far as can be determined this is the first time since 1918 for wheat failure), on various introduced grasses. Survival notes by general observation are as follows:

1. Crested wheatgrass.

   a. Six-year-old stand (Pasture I-4) used each year for grazing and/or seed production 98-100 percent

   b. One- two- and three-year-old stands used for seed production. 100 percent

   c. Seed planted in September 1949 germinated, survived the dry period and is now growing.

(Note): Crested wheatgrass in plots in Pasture H, subject to almost continuous grazing, has had the stand greatly reduced and is being invaded by weeds and western wheatgrass).

2. KR Bluestem.

   Two-year-old stand. 100 percent survival; started greening in April.

3. Blue Panic.

   Two-year-old stand practically 100 percent survival, with plants greening up in April.

4. Switch grass.

   One-year-old stand. Good survival, no evidence of stand decrease; now making good growth.

5. Intermediate wheatgrass.

   One-year-old stand. Does not look too vigorous.

6. Texas bluegrass.

   Two to 7 years old. Looks good; no stand decreases; greened up early."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Rainfall for the month was less than 50 percent of normal. The 2.04 inches of rain fell on 14 days. As the maximum 5-minute rate was about 2 inches per hour, and as there were no prolonged high intensities, there was very little runoff or erosion.

"The corn stand on mulch areas in previous years has been less than that on plowed areas. In order to arrive at nearly comparable corn stands this year, the planting rate on the mulch areas was increased 30 percent over that on the plowed areas. Now it appears that the mulch corn area has a much better stand than the plowed areas. Yield results will, therefore, be interesting.

"In response to a request from SCS Operations at Elyria, Ohio, a mechanical analysis was run on six soil samples. Determinations were made to assist them in sealing the bottom of a farm pond."

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.-"For the month of June the rainfall totaled 2.45 inches at Station 69 compared to a normal of 3.16 inches. Most of this rain occurred during the storm of June 5 with a total of 1.37 inches of rainfall. This rain caused no surface runoff at any of the installations but did cause an increase in seepage flow at some of the stations where this flow has continued since February. Rainfall for the first 6 months of the year has totaled 15.15 inches compared to a normal of 19.6. In spite of this rainfall deficiency of about 4.5 inches crops are in good condition although additional moisture will be needed soon for summer growth in pastures and meadows. The rainfall deficiency has affected the production of grass hays and reduced the yield of oats, but apparently there has been sufficient moisture for other field crops.

"On the next page there is a table showing the monthly rainfall and runoff at each of the runoff measuring stations for the 6-month period, January through June. The major portion of the runoff occurred during the storm of February 12. At the time of this rain most field areas were quite wet and the effect of conservation practices was at a minimum. During February relatively heavy runoff occurred from pasture lands and considerable runoff from native grass areas. The amount of runoff from cultivated land appears to be less than from pasture for this particular storm. These results have greatly influenced the totals for the 6-month period, and the total effect of conservation practices for this period is not great.

"Fall and spring applications of 32, 64, and 96 pounds of nitrogen per acre to fall seeded oats with a uniform application of 200 pounds per acre of 20 percent superphosphate gave the following increases in harvested oats: 32 pounds of nitrogen increased the yield 9.37 bushels per acre; 64 pounds of nitrogen increased the yield 15.84 bushels per acre; and 96 pounds of nitrogen increased the yield 17.58 bushels per acre. The check areas without the nitrate application produced 27.34 bushels per acre. The nitrogen was applied as a top dressing in the form of 32 percent ammonium nitrate. Figuring the ammonium nitrate at $60.00 per ton and the oats at $.64 per bushel, the price received for the oats at harvest, the profit per acre from the applications of nitrogen were as follows: 32-pound rate gave a profit of $2.99 per acre; and the 64-pound rate gave a profit of $4.14 per acre; while the 96-pound rate gave a profit of $2.25 per acre. As may be seen the most profitable return for dollars invested was from the 32-pound per acre application. On a percentage basis the $3.00 per acre

Table 1.--Monthly rainfall and runoff record--January through June, 1950

Area		SW-12	SW-17	C	D	Y	Y-2	Y-4	Y-6	Y-7[1]	Y-8	Y-10	W-1	W-2	W-6	W-10
		Native grass cut for hay annually	Reestablished pasture grass	Conservation practices									Ordinary farm practices			
Land use				Private land[2]	Private land[2]	Improved rotations, terraces, contour cultivation, increased acreage of legumes and grassland							Straight row cultivation. Small acreage of pasture and meadow			
Acres		2.97	2.99	579	1110	309	132	79.9	20.9	40.0	20.8	21.0	176	130	42.3	19.7
Jan.	Rainfall	2.040	2.270	1.798	1.859	2.158	2.117	2.077	2.203	2.208	2.210	1.999	2.250	2.141	2.180	2.080
	Runoff	0	0	.0105	.0100	.0032	0	0	0	0	0	.0048	.0370	.0675	0	0
	Difference	2.0400	2.2700	1.7875	1.8490	2.1548	2.1170	2.0770	2.2030	2.2080	2.2100	1.9942	2.2130	2.0735	2.1800	2.0800
Feb.	Rainfall	3.400	3.610	3.915	3.965	3.512	3.538	3.567	3.542	3.601	3.540	3.586	3.600	3.509	3.410	3.660
	Runoff	.7161	1.2905	1.4086	.9619	1.5019	.8631	.9273	.7779	1.3322	.6820	.8936	1.1598	1.3990	.9523	.9150
	Difference	2.6839	2.3195	2.5064	2.9031	2.0101	2.6749	2.6397	2.7641	2.2688	2.8580	2.6924	2.4402	2.1100	2.4577	2.7450
Mar.	Rainfall	.260	.370	.215	.234	.276	.265	.266	.260	.308	.260	.269	.350	.320	.320	.320
	Runoff	0	0	0	0	.0032	0	0	0	0	0	0	.0327	.1435	0	0
	Difference	.2600	.3700	.2150	.2340	.2728	.2650	.2660	.2600	.3080	.2600	.2690	.3173	.1765	.3200	.3200
Apr.	Rainfall	3.580	3.790	3.426	3.355	3.758	3.733	3.710	3.788	3.755	3.790	3.661	3.778	3.706	3.690	3.730
	Runoff	0	.0954	.0869	.0779	.1353	.0552	.0990	.1428	.2671	.0331	.1246	.2708	.3532	.0556	.2662
	Difference	3.5800	3.6946	3.3391	3.2771	3.6227	3.6778	3.6110	3.6432	3.4879	3.7569	3.5364	3.5072	3.3528	3.6344	3.4638
May	Rainfall	2.890	2.940	2.660	2.660	3.007	3.018	3.022	3.068	3.081	3.070	2.997	2.969	2.647	2.600	2.720
	Runoff	0	0	.1035	.0588	.0210	0	0	0	0	0	0	.0818	.2270	.0050	.0009
	Difference	2.8900	2.9400	2.5565	2.6012	2.9860	3.0180	3.0220	3.0680	3.0810	3.0700	2.9970	2.8872	2.4200	2.5950	2.7191
June	Rainfall	2.370	2.510	2.728	2.703	2.438	2.478	2.482	2.528	2.422	2.530	2.457	2.491	2.572	2.580	2.560
	Runoff	0	0	.0005	.0008	.0155	0	0	0	0	.0099	.0030	.0648	.1353	0	.0102
	Difference	2.3700	2.5100	2.7275	2.7022	2.4225	2.4780	2.4820	2.5280	2.4220	2.5201	2.4540	2.4262	2.4367	2.5800	2.5498
6 mo. total	Rainfall	14.540	15.490	14.742	14.676	15.149	15.149	15.124	15.387	15.375	15.400	14.969	15.438	14.895	14.780	15.070
	Runoff	.7161	1.3859	1.6100	1.1094	1.6801	.9183	1.0263	.9207	1.5993	.7250	1.0260	1.6469	2.3255	1.0129	1.1923
	Difference	13.8239	14.1041	13.1320	13.5666	13.4689	14.2307	14.0977	14.4663	13.7757	14.6750	13.9430	13.7911	12.5695	13.7671	13.8777

[1] No legumes or improved rotations.

[2] General farming, considerable terracing.

investment gave a 99 percent return. The $6.00 per acre application gave a 69 percent return, and the $9.00 per acre investment in fertilizer gave only a 25 percent return.

"The test was on class three land in a cotton, corn, oat cropping system with Madrid clover seeded with the oats in the fall. The nitrate aided the oats in suppressing the fall seeded clover until oat harvest. This may be the answer to the often raised question as to how to keep fall seeded sweet clover from interfering with oat harvest. The phosphated areas without the nitrate showed a much more vigorous growth of clover. The proper balance in fertility level should be maintained for best results."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska. "In June 1950, the project received about 50 percent of the average June rainfall. The 1.97 inches of precipitation received fell during six storms with the highest daily catch of 0.53 inch on July 23. There was very little runoff during the period.

"The grassed waterways on watershed W-5 are in excellent condition and have surpassed all expectations. The weeds in the waterways were sprayed with good results. In about the third week of June grasshoppers became quite prolific, especially in the sweet clover and in the new grass waterways. The waterways were sprayed immediately with Benzene Hexachloride and Toxaphine solution which resulted in an estimated 90 percent kill of hoppers. In one bare spot about 1-1/2 feet square on one of the waterways our farm laborer counted 40 dead hoppers."

Hydrologic Studies - G. A. Crabb, Jr., East Lansing, Michigan.-"June 1 through 9 the Station Supervisor visited in company with Dr. C. E. Millar of the Experiment Station Advisory Committee, the Research Stations at Clemson, S. C.; Raleigh, N. C.; and Blacksburg, Va. This visit, in conjunction with that to the Research Station at Coshocton, Ohio, last fall, was to better enable us to develop a program of stubble-mulch culture for use on a watershed basis to aid in conserving moisture. Mulch tillage has been tried and abandoned on this station as a yield basis. Methods studied here had markedly poorer yields than conventional tillage and were accompanied by an excessive weed problem that almost inhibited production. However, in view of the critical shortage of precipitation, it has been decided to further study mulch practices from a water conservation standpoint. The work at the before-named stations was studied in an effort to determine suitable tillage practices for use here at East Lansing. It is felt that the tillage practices followed in the Carolinas will not be suitable for use in our rotations because the Carolina rotations generally include annual cover crops, rather than the biennial or perennial crops to be found in Michigan. This difference in type of cover crop turned under for mulch has a strong effect on the weed problem. However, the Virginia studies are carried on with a rotation similar to those found in this section, and the weed problem has been successfully counteracted. The Virginia method utilizes seedbed preparation with a modification of the 'double cut' plow, that inverts the top 3-inch furrow slice and stirs the lower layer. This inverted slice is left exposed for a period of time to ensure 'kill,' then gone over with a spring-tooth harrow to bring the mulch to the surface. Following this, the land is disk harrowed to cut the mulch which has been brought to the surface and planted to corn. Small grains are planted with a general purpose drill without prior seedbed preparation. It is felt that this method of tillage promises some success under Michigan conditions, if sufficient time of root exposure between the first and second operations in preparing land for corn can be arranged to permit a

good 'kill' of the cover. It is planned to institute plot trials to determine the length of exposure time necessary and other details of the practice. Following the completion of suitable plot trials, it is anticipated that the mulch practices will be installed on a watershed basis."

Hydrologic Studies - A. W. Cooper, Auburn, Alabama.-"The June rainfall of 2.60 inches represents 64 percent of the 69-year average of 4.07 inches for Auburn. The first runoff from the erosion plots in more than 1 year occurred on June 2 and 4. On June 2, 0.95 of an inch of rain fell in 10 minutes and on June 4, 0.40 of an inch fell in 30 minutes. The only rainfall the previous 2 weeks had been 0.20 of an inch on May 28. A summary of the water and soil losses from the plots that had a crop growing on them is shown in table 1:

Table 1.--Soil and Water Losses from Erosion Plots
Auburn, Ala., June 2 and 4, 1950

Plot No.	Slope %	Vegetative cover	Water loss inches	Soil loss lb./acre
3	5	Cotton	0.44	1,450
4	5	Cotton	.45	400
5	10	Cotton	.76	4,140
6	10	Cotton	.68	7,280
9	20	Corn	.17	906
10	20	Corn	0	0

"There is no apparent explanation for the difference in runoff and soil losses from plots 3 and 4 or 5 and 6. New studies were initiated on these plots this spring, and to date both plots in each pair have been treated the same. A possible explanation of the difference in plots 9 and 10 was that 1,456 pounds of dry matter per acre (crimson clover) were turned under on plot 9 before the corn was planted and 2,873 pounds of dry matter (subterranean clover) were turned under on plot 10.

"Four infiltration tests were made on Lloyd soil, near the irrigation plots, on the Agricultural Engineering farm. Three tests were made with the simulated rainfall 'infiltrometer' developed in South Carolina and one using infiltration rings developed in Texas. The average of two tests on soil with a loose surface was 1.22 inches total infiltration for the first hour and 0.25 of an inch for the second hour. The rate of infiltration at the end of the first hour was 0.38 inch per hour and 0.20 inch per hour at the end of the second hour. On a crusted plot which had received 4.34 inches of artificial rainfall in 2 hours 12 days before, the total infiltration was 0.51 inch. After 35 minutes, infiltration stopped completely. The infiltration measurements using the rings on a loose surface was 1.02 inches for the first hour and 0.67 of an inch for the second hour. The infiltration rate at the end of 1 hour and 2 hours was 0.66 of an inch per hour. The purpose of these infiltration measurements is to determine the rate at which irrigation water can be applied. The data to date are only an indication, as enough tests have not been made to obtain a reliable average for this soil type."

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia.- "Messrs. Holtan and Kirkpatrick report that considerable time was spent in scanning sources of data on flood routing. During preliminary trials of flood routing, it became evident that synthetic derivation of the complete hydrograph rather than just peak rates would be necessary.

"At the present stage of development exact replicates of measured runoff curves can be computed if the true excess curve (rainfall minus retention) and the detention-discharge relationship are known. In this process, the excess curve is divided into regular intervals of time (say 5 minutes) and is then proportioned to runoff and detention within each successive time period. The following equation is used:

$$E - Q_1 = \frac{(q_1 + q_2)\ T}{2 \times 60}\ D_2$$

E = excess at end of period
Q_1 = accumulated runoff at start of period
q_1 = rate of runoff at start of period
q_2 = rate of runoff at end of period

T = time period (5 minutes usually)
D_2 = detention related to q_2

"Estimates substituted for q_2 must balance this equation to be correct. Excellent results are being obtained from known excess curves. However, considerable difficulty is encountered in deriving the true excess curve. The difficulty apparently lies in the determination and application of such abstractions as pocket storage, interceptions, etc., rather than in the infiltration capacity. It is anticipated that infiltrometer studies being considered for the near future would provide much needed information in this respect."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Fennimore was 5.09 inches. There were no periods of high intensities and no surface runoff occurred.

"Precipitation at Edwardsville was 4.84 inches. There were no high intensities, yet the runoff for the month totaled 1.3 inches. This amount of runoff is due to the high moisture content of the soil on June 1.

"Precipitation at Colby was 3.83 inches. All of this was at moderate intensities, but there was some surface runoff due to the high moisture content in the soil on June 1. The peak rate of runoff however, from this area which is about 350 acres, was only 4.5 c. f. s.

"Some of the ponds at Edwardsville, Ill., and Fennimore, Wis., had silted to as much as 6 to 12 inches above the weir crest. This made it impossible to obtain accurate records of runoff. These ponds were all cleaned during the month to a depth of about 12 inches below the weir crest, and therefore should give no further trouble for a few years."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"Mr. Donnelly completed the scheduled series of tests on the box inlet drop spillway. These tests were initiated in November, 1946, and have continued, with interuptions, since that time. Tests have been conducted on about 300 different models and variations, each test requiring from 20 to 50 individual runs. Some analysis of the tests was carried out during the course of experiments, but the work of reducing the data to usable form will be time consuming since much of the analysis remains to be completed. This work has begun. Mr. Blaisdell spent considerable time on the analysis of the rating curve data while Mr. Donnelly concentrated his efforts on an attemmpt to reduce the effect of submergence to a simple form.

"The St. Anthony Falls Hydraulic Laboratory staff completed the printing and binding of one of the two project reports covering the studies made on the drainage system for the Whiting Field Naval Air Station located near Pensecole, Fla. The completed report covers the studies made on a straight drop spillway, the cantilevered ditch outlet, the pipe-ditch transition structures, and the detention-type box inlet drop spillway. Copies of the report were distributed to those concerned with the Whiting Field job and to each of the regional engineering divisions.

"Mr. Blaisdell and Mr. Donnelly spent June 20 and 21 in the Little Sioux River basin area of northwestern Iowa. While there we looked over the flood-control work being done, in company with members of the engineering staff located in the Sioux City office. The trip was well timed. On June 12 there was a rain of 4.15 inches in 6 hours, followed on June 15 by another rain of 1.9 inches in 43 minutes. The resulting runoff loaded at least two structures to their designed capacity and other structures, particularly those designed for the detention of part of the runoff, received fairly good tests. All SAF stilling basins observed apparently operated as would have been anticipated from the model studies. Up to 4 feet of silt was deposited in some of the detention reservoirs. The source of the silt was the corn acreage. Pipe outlets from these reservoirs apparently operated satisfactorily under long continued flows, although one outlet was endangered by severe scour in the vegetated channel below it. The slope of this channel is 4 percent. Cantilevered pipe outlets scoured holes of smaller size than we would have anticipated. Their operation appears to be very good. Scour upstream and downstream from the Norris-Johnson straight drop spillways was less than would have been anticipated from the tests which we made during the East Aldrich Sub-watershed model studies. An explanation of this may be that the resistance to scour of the field soil was much greater than the sand used in the laboratory. It is also necessary to remember that, with one exception, these structures flowed less than one-half full, and that the majority of the scour occurs at flows approximating the designed capacity of the structure. Unexplained is why the one Morris-Johnson structure, which apparently flowed full, should show the least scour. It may be that sediment brought down at the end of the storm filled in the scour hole."

Hydraulic Studies - D. A. Parsons, Minneapolis, Minnesota.-"There follows a brief statement of the purpose of each of several series of tests made during the month in the design and calibration of the Coshocton wheel sampler for runoff.

Series 37 (tests 38 - 113 incl.)--This series of tests was made with the jet from a 1-inch diameter pipe, varying: (1) the discharge, and thereby the velocity of the water; (2) the direction of the jet relative to the wheel axis; (3) the speed of rotation of the wheel; and (4) the point of sampling relative to the center of the wheel. The ratio of the sampler catch to total flow was determined.

Series 38 (tests 1 - 26)--The thickness of the metal forming the slot edges is a factor in the catch for narrow slots. These tests were made under identical conditions with some of those for Series 37, except for a difference in metal thickness.

Series 39 (tests 1 - 12)--Sampled jet from 9-inch wide trough. Thickness of slot wall was 0.139 inch. Wheel center was 1/2 inch right of trough center line.

Series 40 (tests 1 - 12)--Same as Series 39 except that trough was 4-7/8 inches wide.

Series 41 (tests 1 - 12)--Same as Series 40 except that wheel center was on trough centerline.

Series 42 (tests 1 - 18)--Sampled jet from 1-1/2-foot H flume. Thickness of slot metal, 0.139 inch. Two foot diameter wheel with center 1/2 inch right of flume centerline.

Series 43 (tests 1 - 18)--Same as series 42, except thickness of slot metal was 0.064 inch.

"Each test of series 39 to 43 was made at a constant flow. The flows of the several tests ranged up to about 2 cubic feet per second.

"Two more experimental wheels were constructed for calibration. They are of different size but geometrically similar to the 2-foot diameter wheel used in series 39 to 43, except for the slot width. The one foot diameter wheel has a slot designed to take 2 percent of the flow up to a flow of 1/3 cubic foot per second. The 3-foot diameter sampler is designed to take two-thirds of 1 percent of the flow with a maximum flow of about 5-1/2 cubic feet per second."

Hydraulic Studies - W. O. Ree, Stillwater, Oklahoma.-"The recent efforts at the laboratory have been devoted to installing new experiments and establishing new grasses. It is hoped some of the new experiments will be ready for fall testing.

"A report of the present condition of the channels in Blocks D and F is given in the following tabulation:

Channel No.	Cover seeded	Time of planting	Present condition
FC9	Buffalo grass	Fall '49	No stand
FC10	Intermediate wheat grass	Fall '49	No stand
F611	Smooth Brome	Fall '49	Good stand
FC12	Kentucky 31 fescue	Fall '49	Fair stand
FC13	Switch grass Blackwell strain	Spring '50	Very good stand
FC14	No test lining, temporary cover of winter oats and lespedeza		
FC15	Intermediate wheatgrass	Fall '49	Very poor stand
FC16	Switch grass Blackwell strain	Spring '50	Very good stand
FC17 and 18	No test lining, temporary cover of winter oats and annual lespedeza		

"The very dry fall and winters are partly responsible for the very poor showing of the fall sowed species. The very good stands of switch grass are believed due to the use of a mulch after seeding and some sprinkler irrigation.

"A combination channel (FC25) having a concrete gutter down the center with vegetation along the sides has been completed except for a short approach section at the entrance. The vegetation in the upper half of the channel is weeping lovegrass, and that in the lower half is bermuda grass. The weeping lovegrass was seeded on April 11, 1950, by broadcasting at the rate of 3 pounds per acre. Fertilizer of 16-20-0 analysis was applied at the rate of 200 pounds per acre. The channel was then mulched with clean lovegrass hay at the rate of 2 tons per acre. Some sprinkler irrigation was applied. By mid-June the stand of weeping lovegrass was excellent averaging about 12 inches in height with seed heads already appearing. Rapid establishment of weeping lovegrass is one of its chief advantages.

"The concrete work for the forebay at the head of channels FC25 and FC26 has been completed. The biggest part of this job was the building of a notch type drop-structure. This structure has a capacity of 175 cubic feet per second. The total drop from crest to apron is 4 feet. The construction is of reinforced concrete.

"Grading of the east dike which directs the waste flow from blocks B, D, and F into the main waste channel has been started and is now 50 percent completed. Prior to construction of this dike considerable drainage work had to be done to divert seepage flows."

Sedimentation Studies - L. M. Glymph, Jr.-"On May 8 and 9 of this year portions of southeastern Nebraska were hit by a severe flood. It resulted from an intense rain centering 10 - 15 miles south and southeast of Lincoln. Some reports give the total precipitation as high as about 12 inches in about 4 hours. There are no intensity gages in the areas of highest rainfall, but the resulting runoff and flood stages were of record proportions on a number of locally well-known and important tributaries in the Missouri Basin. Damage in Lincoln and to other towns, to roads and highways, to farmsteads, and to agriculture generally was very great. This flood has given emphasis to local interest in flood control programs and there is under way at the present time a concerted effort to bring about development of some specific plan for watershed treatment in the area affected.

"While the flood has been spectacular from the standpoint of damages to floodplain developments, the situation also affords a good opportunity for making some observations on resulting residual damage to floodplain lands. There is very little recorded information on the effects of flood-borne sediment and scour on land productivity. These items are customarily evaluated in an inventory of flood damages. But for the most part the evaluations are based on opinions and conjecture rather than on observed experiences. With this in mind, a part of the flood area was examined with the idea of locating some floodplain fields that had been subjected to various degrees of deposition and scour where records of crop production could be obtained.

"It proved difficult to find fields having uniformity in contrasting physical conditions on areas large enough and otherwise meeting conditions desired for the observations. Two fields were selected, however, which seem to meet the requirements very well. They are in different watersheds and about 20 miles apart. One field is about 25 miles from Lincoln and the other about 15 miles away.

"One of the selected fields was plowed last fall and was ready for corn when the flood came this spring. On it there is an area where the topsoil was removed to a depth of about 8 inches, an area of practically no change where 6 to

8 inches of the fall-plowed surface remains, and another where about 6 inches of sediment was deposited on the plowed surface. On the other field, which had been disked this spring before the flood, there are well-defined areas of sediment and scour.

"Arrangements have been made for cooperation of the farmers and landowners involved and the areas to be observed mapped out and marked in the fields. On the first of the above described fields soil and sediment samples from small areas equivalent to nine one-hundredth acre plots have been taken. Four plots are being sampled on the second field.

"Both of the fields were double-disked after the flood and listed to corn. The plot areas are being treated exactly like the remainder of the fields in accordance with the customary practice of the farmer. It is planned that periodic observations of the plots will be made during the growing season and that they will be harvested for records at harvest time. The farmers plan to plant these fields to corn for the next several years, and it is hoped that records can be obtained for a least three crop years."

Supplemental Irrigation - J. R. Carreker, Athens, Georgia.-"Rainfall in June totaled 4.24 inches, 0.17 inch above the normal of 4.07 inches. All the rain fell in light showers in 10 days as follows: June 2 - 0.33 inch, 3 - 0.40 inch, 4 - 0.53 inch, 7 - 0.10 inch, 8 - 1.05 inches, 10 - 0.75 inch, 21 - 0.40 inch, 22 - 0.53 inch, and 29 - 0.15 inch. Evaporation losses from the pan amounted to 7.492 inches, with 0.399 inch on June 28 the largest amount any day. Wind movement was 976 miles.

"The daily temperature was moderate during the first 13 days, but was high the latter half of the month. The maximum reading was 89 or above every day after June 14 and was 101 and 102 on the 26th and 27th respectively.

"The soil moisture was high the first half of the month but rapidly became deficient after the 12th. Irrigation was needed on all crops before the end of the month."

"The irrigation plots of vegetables, corn, and pastures were covered with one application of water and the second round was in progress at the end of the month.

"The corn for the irrigation studies was due for a cultivation and nitrate side dressing early in June. The frequent showers at that time prevented this work until the corn was too large to run the tractor through it.

"Therefore, the nitrate application was made through the irrigation system. A mixture of Uramon and ammonium nitrate was used to make a solution similar to the solution 32 used in 1949.

"Application rates of 70.5, 141.0, and 211.5 pounds per acre of N were made on Block I and 70.5 lb/acre on Block II. The necessary quantity of materials was applied in 8 to 12 minutes. The corn washed only about 3 minutes after the material cleared from the sprinklers. No detrimental effects were noticed on the corn from these applications.

"One measurement of the root distribution under oats was made at Watkinsville. The air dry weights of the roots in a sample 8 inches wide x 12 inches long were:

0 - 3" depth	=	7.52 grams
3 - 6" "	=	1.28 "
6 - 9" "	=	.51 "

"A few primary roots extended below the 9-inch depth, but were not sampled.

"Similar measurements were made under the Dallis grass, Ladino clover pasture sod in our pasture I at 1 site. The weights for different parts for a sample area 6 inches wide x 12 inches long were:"

Tops - grass	=	8.50 grams
- clover	=	4.68 grams
- other	=	0.53 "
Crowns	=	8.23 "
Roots: 0-6" depth	=	17.87
6-12" "	=	2.85
12-18" "	=	1.15
18-24" "	=	.73
Wild Onion bulbs		4.16

Supplemental Irrigation in Virginia Agricultural Production - T. W. Edminster, Blacksburg, Virginia.-"The total rainfall for the month was 3.20 inches." The pasture system was operated from June 12-22 completing another application of 1.5 inches on the irrigated lots.

"An application of 1.2 inches was applied on the alfalfa and burley tobacco plots on June 14. Another application of 1.2 inches was applied on June 28 to the burley tobacco and alfalfa plots. These plots were irrigated when the available moisture was approximately 50 percent of field capacity.

"The corn plots were irrigated in accordance with the soil-moisture depletion study at different intervals during the month."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.-"The entire area suffered for rain for the first 3 weeks of the month. During the last week rains began which appeared to forecast the beginning of our typical summer rainy season.

"In Lake Okeechobee the stage declined to 13.05 feet, M. S. L. at the end of the month. Rainfall at the Everglades Experiment Station was 6.92 inches, and evaporation from the standard pan was 6.846 inches. The mean maximum temperature was 93.2 degrees, and the mean minimum temperature was 67.5 degrees.

"As a result of last month's tests of chlorinated napthas, which were used on a small scale and showed promise in destroying aquatic mosses in farm drainage ditches, it was decided to re-run the test on a larger scale to determine the practicability of using our present equipment on a farm basis and the approximate cost of such treatment.

"Inspection of the ditch originally treated on May 1, showed that in the reaches where WS 1492 was applied, the only apparent growth was that emerging along the sides of the channel where the emulsion had been unable to contact the plants because of the low water during application.

"A lateral ditch 1/2 mile north of the original ditch and similar in size and aquatic growth conditions was selected. The method of treatment was similar to that described in last month's report. The principal difference was that it was decided to attempt to apply an average quantity along the ditch equal to 250 p. p. m. Since the channel was not exactly uniform in cross section, it was realized that some variation in concentration would occur, and small variations in amounts applied were made by varying the pressure on the pump where the cross section changed size for any long distance. On the whole, however, the rate of application was as uniform as would be feasible for jobs done by the farmer.

"Formulation WS 1492 which showed best results on the first trial, was applied over a length of 1,560 feet. A total of 28-3/4 gallons of chemicals was applied resulting in an average concentration of 240 p. p. m. Formulation WS 1494 was applied on the next length of 2,060 feet using a total of 33-3/4 gallons with an average concentration of 216 p. p. m. On a short stretch of approximately 200 feet 3-1/3 gallons of WS 1494 was applied as a surface application without trying to mix the chemical with the water in the ditch. Finally, a section of the ditch approximately 800 feet long was treated with about 12 gallons of WS 1495 with a resulting average concentration of 140 p. p. m. A tabulated summary of the elements of these treatments showing size of channel, formulation and amount used, and resulting concentrations along each 100-foot section of the ditch appears on the next page.

"An inspection of the ditch 5 days later showed that WS 1492 had caused the green color of the moss to start turning black, and disintegration had begun. On the other applications the moss appeared to be burned at the top for a depth of 2 to 3 inches, but retained a good portion of its green color at the bottom. An inspection 19 days after the application showed almost complete kill and disintegration for the WS 1492, while the WS 1494 showed a fair kill but not good disintegration, and the WS 1495 again showed the least results.

"It was noted that as on the previous test the fish kill was limited mainly to the Gar and Mudfish as the gamefish appear to leave the ditch when the water is drawn down prior to treatment.

"From progress to date, it appears that WS 1492 can be used effectively in similar conditions with an average concentration of 250 p. p. m. The cost of material, estimated at $.35 per gallon, would run about $35.00 per mile on the lateral treated in this case. While the spray equipment used can no doubt be improved upon, the rate of application averaged 1 mile per hour, using a small tractor to tow the boat at proper speed.

"When an additional supply of WS 1492 is received by the Everglades Experiment Station, further studies will be made in regard to additional 'mop-up' work in attaining a complete kill along the edges of the ditch, and also further work to determine the practicability of obtaining kills with surface spray only will be done."

Drainage Studies - I. L. Saveson, Baton Rouge, Louisiana.-"Weather conditions have permitted us to get 3 weeks run on the precision grading test area at St. Delphine Plantation. This area is 60 percent completed. The large Eversman land leveler is proving a very adaptable grading tool for sugarcane land. On the present area we are crossing the ditches and filling them since the area is to be relaid.

"A two-wheel scraper was received this past week from the Garwood Manufacturing Company, gratis, to run a number of tests on the adaptability of two-wheel scrapers

Table 1.--Summary elements of chlorinated naptha test for eradication of aquatic mosses, Osborne's Grove, June 14, 1950

Station	Average width (Ft.)	Average depth (Ft.)	Surface acreage	Formulation used	Amount material (Gal.)	Approximate concentration (P. P. M.)
0+00 to 1+00	11.2	1.2	0.0257	WS 1492	1.17	120
1+00 to 2+00	10.3	1.1	.0236	" "	2.71	320
2+00 to 3+00	10.3	1.1	.0236	" "	2.77	330
3+00 to 4+00	10.2	1.0	.0234	" "	1.81	240
4+00 to 5+00	9.5	.9	.0218	" "	1.81	280
5+00 to 6+00	10.0	1.2	.0230	" "	1.72	190
6+00 to 7+00	10.0	1.0	.0230	" "	1.79	240
7+00 to 8+00	11.3	1.3	.0259	" "	1.72	160
8+00 to 9+00	10.3	1.3	.0236	" "	2.46	250
9+00 to 10+00	10.7	1.2	.0246	" "	1.65	170
10+00 to 11+00	10.0	1.1	.0230	" "	1.45	180
11+00 to 12+00	8.3	.9	.0191	" "	1.34	240
12+00 to 13+00	9.0	1.1	.0207	" "	1.01	140
13+00 to 14+00	8.7	0.8	.0200	" "	1.57	300
14+00 to 15+00	9.0	.7	.0207	" "	1.48	310
15+00 to 15+60	9.7	1.0	.0134	" "	2.29	520
15+60 to 16+00	9.7	1.0	.0089	WS 1494	.77	270
16+00 to 17+00	9.7	1.0	.0223	" "	1.99	270
17+00 to 18+00	8.7	1.0	.0200	" "	1.65	250
18+00 to 18+85	9.3	1.0	.0181	" "	1.46	250
18+85 to 20+00	received no treatment					
20+00 to 21+00	12.0	1.0	.0275	" "	1.70	190
21+00 to 22+00	11.2	1.1	.0257	" "	1.70	180
22+00 to 23+00	10.8	1.1	.0248	" "	1.70	190
23+00 to 24+00	10.2	1.0	.0234	" "	1.70	220
24+00 to 25+00	10.3	1.0	.0236	" "	1.52	200
25+00 to 29+61	11.7	1.2	.1017	" "	7.74	160
29+61 to 36+21	10.8	1.1	.1636	" "	11.83	200
36+21 to 38+31	10.2	1.1	.0492	" "	3.35	190
38+31 to 46+06	11.3	1.3	.2011	WS 1495	12.10	140

Note: From Station 36+21 to Station 38+31 was surface sprayed only.

for grading sugarcane land.

"Regional Engineer, J. J. Coyle, Regional Agronomist, W. M. Nixon and State Conservationist, H. B. Martin visited the project on June 29 and 30 to go over the project and observe the work. They were interested in the ditch bank mower and the writer took them to Thibodaux to observe the Thompson mower. The Thompson Machinery Company put on a demonstration. This mower works on a whirl-a-way principle and is mounted on a contacting arm. It will cut saplings up to 4 inches in diameter and mow a vertical ditch bank. The material mowed is thrown out of the ditch. The finished job is equal to work done by a lawn mower."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.-"Mr. Phelps Walker makes the following report on the engineering phase of the drainage research program.

"Weather conditions in Nansemond county were more favorable than they were in May. With the exception of a dry area around the City of Suffolk and the Presson farm, rainfall occurred at times and in amounts to keep soil moisture suitable for plant requirements and still not hinder cultivation of crops. In terms of the farmers, 'the season has turned into one of the best so far.'

"The table on the next page is a continuation of the one submitted last month. It shows that the more heavy rainfall during the first week of June had some effect upon the position of the water table but, in general, soil water has fallen between 0.5- and 0.9-foot in the Suffolk-Holland area.

"The dry season continues in Princess Anne and Accomac Counties. No data were received from either of these counties in time to be incorporated in the discussion. However, it is understood that soil water is too deep in the soil for the data collected to be of value for drainage investigation.

"The Darcy Law ($Q = PIA$) states that the volume of liquid that passes through a homogeneous media is proportional to the permeability of the media, the hydraulic gradient of the phreatic surface and the area through which the liquid moves. Aronovici and Donnan have modified the equation of this law to make it applicable to soil--a non-homogeneous media. They expressed it with the equation $S = 4P(b^2 - a^2)/Q$. But is is questionable if this modification is suitable for use by this project.

"As pointed out in previous reports, the method of observation used at present does not lend itself readily to this equation. For example, the units of Q are in volume per time per unit of linear measure. The units of discharge from the pump system are in volume per time per unit of circular measure, which cannot be converted directly, if at all, into linear units.

"The pump system has been used successfully in Imperial Valley as a method for determining the permeability of the entire soil profile.

"In modifying the equation, apparently it was assumed that all soils under drainage investigation contain an impermeable 'barrier' at some dpeth just below 'desirable tiling depth.' There are indications that this barrier may not occur in all wet soils of Virginia's Coastal Plain. If this is correct, it will be necessary to approach the problem in a different manner."

Table 1.--Amounts of precipitation and depths to water table for drainage observations in work group 20--June 1950

Date	Site 4 - H. G. Presson		Site 10 - J. E. Rawls		Site 12 - S. W. Lee	
	Precip. from prev. date	Depth to water table at well 311	Precipt. from prev. date	Depth to water table at well 177	Precip. from prev. date	Depth to water table at G-IV
	Inches	Feet	Inches	Feet	Inches	Feet
June 3	(1)	6.9	-	2.4	-	3.4
5	0.60	6.8	2.05	1.8	1.97	2.3
12	.76	6.8	.52	2.8	.47	3.0
19	.12	7.0	.18	3.1	.11	3.5
26	.29	7.6	.75	3.2	.99	3.6
30	.11	7.8	.20	(2)	.19	3.9
Total Precip.	1.88		3.70		2.73	
Change in depth of water during June		0.9		0.8		0.5

[1]Precipitation given in report for May 1950

[2]Water too deep in soil for recording.

IRRIGATION AND WATER CONTROL DIVISION

Permeability and Stability of Soil and Soil Materials - C. W. Lauritzen, Logan, Utah.-"Work continued on our study attempting to evaluate the reliability of permeameter measurements by means of some tank installations. Initial results seem to indicate that the permeability of material may be modified considerably by the installation of permeameters and seepage meters even when great care is exercised with the installation.

Lining of Irrigation Canals and Ditches - C. W. Lauritzen, Logan, Utah.- "Considerable work was done at the River laboratory. The buried membrane lining in section 2D and the damaged buried membrane lining in section 3D were removed and the subgrades in these sections were reconditioned as also in sections 7 and 8D and the following experimental linings installed:

"Section 2D--Burried asphaltic membrane. Catalytically blown asphalt applied at the rate of 1.25 gallons per square yard on a subgrade of sand filled pea gravel. The covering consisted of 2 inches of sand followed by a 3 inch topping of gravel.

"Section 3D--The lining in section 3D differed from that in 2D only in that 1.75 gallons per square yard was used.

"Section 7D--The lining in section 7D was also buried asphaltic membrane but of the prefabricated type. The prefabricated membrane was manufactured by the Lloyd A Fry Roofing Co. of San Leandro, Calif. It was supplied in rolls, is about 3/8 of an inch in thickness and consists of asphalt on a backing of 90 pound craft paper. The rolls were 36 inches in width and it was installed in strips with the paper side up perpendicular to the direction of the flow. The 2-inch lap joints were scaled by painting the paper side with RCS-1 asphalt. The cover used was the same as in section 2D and 3D, 2 inches of concrete sand followed by 3 inches of gravel.

"Section 8D--"The lining in 8D consists of an asphaltic membrane protected with a topping of asphaltic macadam. The membrane was applied at the rate of 1-1/2 gallons per square yard, covered with 2 inches of 3/8 to 3/4 gravel and this penetrated and bonded together through an application of 2 gallon per square yard of the same asphaltic material. In all cases the asphalt was applied at approximately 400°F. and the rates obtained conformed closely with the specifications. Considerable spauling of the soil cement linings took place during the winter. The extent of spauling was measured by removing and weighing the loose material. As a precaution against leakage along the division board the ends of the soil-cement sections were sealed with hot asphalt. It is planned that these linings will be removed and replaced with buried asphaltic membrane linings after a month or two."

Snow Surveys and Irrigation Water-Supply Forecasts - H. J. Stockwell, Ft. Collins, Colorado.-"Special snow surveys were made on the North Platte Watershed about June 1 by Mr. Washichek. These surveys were made because of the critical water-supply forecast at Seminoe reservoir and Kortez Dam site in Wyoming. Current runoff on the North Platte indicates that the April 1 forecast of about 115 percent of normal will be close to the actual flow.

"About 200 snow course markers and 200 trail markers were made and shipped to various snow-survey leaders.

"The Transcript of the meeting of the Colorado River Forecast Committee has been mimeographed in about 115 copies and mailed to interested organizations and individuals. A transcript of the Rio Grande Water Forecast Committee has been prepared in rough form and sent to the Regional Office at Albuquerque for checking and concurrence since they co-sponsored the meeting. It will be published in July.

"Messrs. Stockwell and Washichek established eight new courses along U. S. Highway 40 on Berthoud, Rabbits Ears, and Gore passing from elevations of 8,500 to 11,300 feet. It is expected that these courses will tend to complete the snow-survey system in this area and tend to eliminate some of the more inaccessible courses in a few years. Sketch maps have been prepared on these courses. Mr. Washichek made a snow-course maintenance trip in northern Colorado during the last week of the month.

"Informal discussions on support of the Snow Survey program by the Bureau of Reclamation were held in Denver on June 12. Three new courses have been requested by Region VII."

Snow Surveys and Water-Supply Forecasting - W. D. Criddle, Boise, Idaho.-"A large portion of the month was spent by Mr. Nelson in refining the office records and revising the forecast correlations. However, one field trip was made into southeastern Idaho and western Wyoming in lining up the snow-survey work for this coming season. Snow surveyors and cooperators were contacted in the vicinity of Pocatello, Montpelier, and Afton, Wyoming.

"During the month of June the rivers in northern Idaho ran extremely high causing some flood damage along the Kootenai in the northern end of the State. Also, the Columbia River was high in the vicinity of Portland and caused some little damage. Stream flow seems to be verifying the accuracy of the forecasts made earlier in the spring."

Snow Surveys and Snow Covers - R. A. Work, Medford, Oregon.-"Mr. Frost reports that studies were initiated of runoff in relation to snow cover for Clackamas, North and South Santiam Rivers, and Willamette River, all preparatory to certain runoff forecasts requested by the Federal Power Commission.

"A First Progress Report of the Medford Cloud Seeding studies was completed by Mr. Beaumont, in collaboration with W. T. Frost. Copies were forwarded to Oregon State College and to Division of Irrigation. Several conferences were held with the superintendents of the various irrigation districts concerned, with the pilots, and with other interested parties concerning the outcome of the first year's flights.

"In collaboration with Dr. H. G. Wilm, Chief Flood Surveys Division, USFS Portland, and Morlan Nelson, Snow Survey leader of SCS for Columbia River basin, extensive preliminary computations were initiated by Work on a forecast method for flood peaks based on snow surveys. It will be several months before this formula can be completed but it now looks extremely promising.

"Preparations for summer snow-course maintenance work were initiated by Mr. Frost and Mr. Beaumont.

"Mrs. Gloria Fichtner has well in hand details preparation to issuance of a new snow-survey summary for Oregon which is due for publication in 1950. About 3 months' time will be required henceforth for completion of this report by Mrs. Fichtner."

Consumptive Use in Northeastern Region 1 - H. F. Blaney, Los Angeles, Calif.-"In connection with the survey of irrigation problems of the Northeastern States, made the latter part of May at the request of Region 1, tentative normal monthly rates of consumptive use of water for different crops were determined from climatological data for several areas. The following tabulation illustrates some of the results in two areas:"

Month	Consumptive use of water, in inches[1]					
	Northampton Area, Mass.			Hancock Area, Md.		
	Alfalfa and pasture	Potatoes	Tobacco	Alfalfa and pasture	Deciduous trees[2]	Tomatoes
	k = 0.80	k = 0.60	k = 0.55	k = 0.80	k = 0.75	k = 0.65
April	3.29			3.71	3.48	
May	4.61		3.17	4.98	4.67	4.05
June	5.37	4.03	3.69	5.66	5.31	4.60
July	5.86	4.39	4.03	6.08	5.70	4.94
August	5.25	3.94	3.61	5.54	5.19	4.50
September	4.11			4.52		

[1]Computed from formula $u = kf$ = monthly consumptive use, where k = monthly coefficients, t = mean monthly temperature, p = monthly percent of daytime hours, and $f = \frac{tp}{100}$ = monthly consumptive-use factor.

[2]Includes cover crop.

Irrigation Requirements in New Mexico - H. F. Blaney, Los Angeles, Calif.-"A field trip was made over the principal irrigated areas of new Mexico with E. G. Hansen of State College for the purpose of obtaining additional data on dates of planting and harvesting different crops, irrigation practices and adequacy of water supply. Conferences were held with District Conservationists and members of the Region 6 Soil Conservation Service staff at Albuquerque. Marvin Litz assisted in tabulating climatological records and computing monthly consuptive use by alfalfa and hay crops for many of the areas. Additional data will be compiled and analyzed for a report on irrigation requirements in New Mexico."

Antelope Valley Soil Conservation District Sprinkler Study - W. W. Donnan, Los Angeles, Calif.-"Several days were spent with G. Marvin Litz at the Antelope Valley Field Station of the University of California assembling and installing the portable sprinkler irrigation system in the two alfalfa test plots. The initial tests will be made to determine whether a close spacing of sprinkler heads will provide better distribution of moisture in the excessively high wind which characterizes the Antelope Valley climate. On one plot the heads are spaced at the conventional 50 x 50-foot spacing, and on the second plot the heads are spaced at 20 x 50-foot spacing. The 20-foot spacing is at right angles to the prevailing wind. Four-inch Neptune water meters were installed to catch the sprinkler fall and record the pattern of distribution in an inner square sub-plot within each of the two areas being sprinkled. Wind, temperature, and humidity will be recorded at the plots during each test run. As an added study, soil-moisture sampling will be conducted before and after irrigation on each plot. This study is being made at the request of the Antelope Valley Soil Conservation District and Operations."

Assistance to Operations - W. D. Criddle, Boise, Idaho.-"During the month of June considerable assistance was given to Operations in conducting farmer irrigation demonstrations throughout the State of Idaho, and in the vicinity of Elko, Nev. At four farmer demonstrations held in southern Idaho more than 400 farmers attended. At these demonstrations special emphasis was placed on the amount of water entering the soil, the lengths of run, proper size of streams to use and the control structures suitable for controlling the furrow streams. These demonstrations were held in cooperation with SCS Operations and with the Extension Service of Idaho. Such a cooperative arrangement is believed to be particularly suitable for conducting farmer irrigation demonstrations."

Irrigation Studies - A. R. Codd, Bozeman, Montana.-"Snow-survey measurements were carried on at 15-day intervals by the Forest Service Flood Control Survey Section at Missoula. These surveys were made at snow courses used earlier in the season. These data were made available to this office and small interim bulletins were issued to keep interested agencies informed of the conditions. Potential damaging high flows have and are occurring on the Kootenai and other local streams at isolated places.

"Correlation work on stream flow, snow survey, precipitation and temperature data was started during the month. A plan has been devised to systematically analyze these various factors effecting seasonal stream flow in an attempt to create a forecasting scheme for the Missouri River. Because the spring precipitation has such an outstanding effect on the streams east of the Continental Divide this variable is being given considerable consideration.

"The length of snow-survey records in Beaverhead and Jefferson Rivers are limited to recent years which makes reliable results difficult. The only hope here is to build up a temporary relation with the hope of improving it as years progress.

"It is planned to develop a seasonal stream flow routing system in order to make the scheme complete from snow to downstream termination and later to break the forecasts apart into its component parts to detect weak or troublesome basins. An effort is being made to use tabulations and correlations started by Mr. O. W. Monson in past work on this project. The Montana Experiment Station is assisting financially by supplying part-time help. Another phase in this project is to study the possibilities of setting up this correlation work so that I. B. M. cards could be used and make use of the I. B. M. machines here on the campus for the statistical analysis computations. Conferences on the latter phase of the work have been arranged with college staff members; no definite results or decisions have been made up to this date."

Irrigation Studies - P. E. Ross, Weslaco, Texas.-"A conference was held on June 29 with zone conservationist M. A. Hartman, Drainage Engineer T. C. Anderson, both from the Regional Office in Ft. Worth, District Conservationist W. T. Moon of Harlingen, Soil Survey Supervisor R. E. Daniell and Work Group Engineer R. C. Barnes. Discussions of findings in research work on irrigation and drainage and comparisons with the findings of the men in operations were interesting and beneficial both to research and operations."

Water Spreading for Recharge of Underground Basins - A. T. Mitchelson, D. C. Muckel, E. S. Bliss, C. E. Johnson.-"San Joaquin Valley.- Organic matter decomposition studies were continued, and rates calculated for the initial period of 15 days.

"These results indicate that redwood sawdust is very resistant to decomposition. The cotton stems were the most resistant of the various components of the gin trash studied. The alfalfa decomposes at a very rapid rate. The utilization of plant materials, such as those given in the plant table,* in the improvement of soil structure is largely dependent upon the rate at which decomposition takes place. The rate of decomposition is part of the complex problem of management of organic materials which are added to the soil in an effort to develop a soil structure which will remain permeable to water during long submergence.

"Two sets of six percolation tubes set up for comparing percolation rates of Wasco and Minter Field soil were continued. A 100 ppm solution of Renex--a detergent--was added to three tubes of each group to compare its effects on the percolation rate of the two soils and to study is effects on micro-organism counts at three different time intervals. These tests are still going forward. Percolation rates have been severely depressed in both soils by the Renex.

"Three other groups of four tubes, each of which have been drying since treating with water extract from gin trash, were restarted. Tap water was used on all three groups in the second run. The higher initial rate in the second run for the two groups of treated tubes, may indicate a small amount of structural development took place in the soil due to stimulation of micro-organisms by the extract. Apparently the treatment was not prolonged sufficiently to cause a permanent improvement. The few weak aggregates formed, rapidly broke down and effectively sealed many pores, lowering the rate to less than the control group.

"Programs of operation for the Minter Field ponds were revised owing to a change in the water supply. Because of a decrease in flow of the Kern River, it was necessary to discontinue use of this water and to again use well water. Since the waters are different in quality, part of the tests are designed to determine the effect of the quality on percolation rate. Well water has consistently given higher percolation rates and it is believed this is due to the higher hardness.

"The large spreading areas near Minter Field had to be shut down when the Kern River supply failed. However, a sufficient length of run was obtained to definitely establish the fact that the gin-trash-treated area was not incubated sufficiently by rainfall alone. The tests substantiated our belief that the use of gin trash to promote percolation requires proper management or detrimental results might occur during a critical period."

Irrigation Studies - Upper Santa Ana River (San Bernardino County, Calif. - D. C. Muckel, Pomona, Calif.-"Calculations are now about complete for annual amounts of deep penetration resulting from rains on the valley floor in the Bunker Hill, Devil, Cajon, Lytle, Colton, and Reche Canyon basins. One major reason why the ground-water table has declined during the past few years is clearly shown by the amounts of deep penetration. In Bunker Hill Basin, the 27-year (1922-23 to 1948-49 inclusive) average annual deep penetration is 15,000 acre-feet. During the past 4 years (1945-46 to 1948-49), penetration has averaged only 10 percent of the long-time average. The last year when average or above-average deep penetration has occurred was 1943-44. The maximum accrued in 1940-41 when there was approximately 54,000 acre-feet of deep penetration resulting from rains on the valley floor in Bunker Hill Basin."

*Table can be obtained from project on request.

Seepage Losses from Irrigation Channels - C. Rohwer, Ft. Collins, Colorado.-"At the request of the Director of Region VII of the Bureau of Reclamation, seven additional copies of the Progress Report on the Seepage Rings were prepared for the Directors of the other Regions of the Bureau and for the Commissioner of Reclamation."

Drainage Studies - E. W. Cowley, Grand Junction, Colorado.-"Almost the entire month of June was devoted to the exploration of the possibilities of drainage on an area immediately west of Grand Junction by means of pumping from wells. This project has been mentioned in my previous reports.

"In the course of these investigations six test holes, 6 inches in diameter, were drilled. Samples of the underlying strata were taken for future investigation. The drilling was financed 100 percent by the County Research Committee on Soils and Drainage from a fund set up early this spring. This was mentioned in my February report. All drilling was done by local contractor using a Keystone 50 cable tool rig. The results, to date, are encouraging. In all but one case the water bearing strata, composed of sand or fine gravel or both, was encountered at depths of from 12 to 45 feet. These strata vary in thickness from 15-25 feet and are confined by a medium to heavy clay soil on top and shale underneath. In all cases there is sufficient pressure in the sand and gravel to cause the water to rise to within about 5 feet of the surface. Samples of the water-bearing strata are being sent to both the Soil Conservation Service, Soils Laboratory, at Albuquerque, N. M., and the U. S. Regional Salinity Laboratory, at Riverside, Calif., for analysis. When these analyses are completed recommendations will be made relative to the best location and method of construction of a drainage well. Funds in the amount of $1,500 have been made available by the local Soil Conservation District for the construction of an experimental well, if such a project is found feasible."

Irrigation Studies - I. D. Wood, Denver, Colorado.-"From June 1 to 2, worked on paper for the American Society of Civil Engineers. Also worked on interior of Government sedan delivery for easy packing of materials to be carried.

"On June 5 to 9, at the request of the Regional Director of Region III a trip was made to Shenandoah, Iowa, for the purpose of instructing personnel of the district office at that point with regard to sprinkler and surface irrigation. Twenty-nine persons were in attendance--mostly from Soil Conservation Service but also from the Research Department of Iowa State College and from the Climatology Section. The meeting was also attended by Mr. Frank H. Mendell, State Conservationist. The work consisted of field trips for the inspection of prospective irrigation projects located in Missouri River bottom across the river from Nebraska City, Neb. Some land which had been leveled and is currently being irrigated was also inspected. On the last day a technical school was held covering the subjects of land leveling and water distribution.

"June 10 and 11 were spent working on the Government sedan delivery which is being prepared for carrying a complete set of irrigation equipment as well as instruments.

Irrigation Studies - F. B. Hamilton, Lincoln, Nebraska.-"Tests were run on an aluminum gated pipe manufactured in Nebraska. This pipe is intended for use either as sprinkler line pipe or gated pipe. It is made by a special welding process from sheet aluminum.

"The gates are a sliding type with a rubber gasket. They are leakproof at the full range of heads used until failure occurs.

"The gates failed by blowing out at approximately 90 p. s. i. After the pressure is released the gates can be replaced. However, considerable defromation occurs in the pipe at the edge of the gate openings.

"The pipe itself withstood 150 p. s. i. satisfactorily."

Irrigation Studies - P. E. Ross, Weslaco, Texas.-"Soil-moisture determinations before irrigation showed the soil to be almost at wilting point in the first foot, about 50 percent field capacity in the second foot, and very near field capacity in the third and fourth foot. With this moisture level, the plants appeared to need water badly for continued growth and maximum setting and holding fruit. Root zone examination also showed that by far the majority of feeding roots were in the first foot. It is felt that there is a definite relation between this shallow feeding of cotton and the plow sole mentioned in previous reports."

Silt Studies - D. W. Bloodgood, Austin, Texas.-"All current silt determinations have been completed for March and April, and typed copies have been mailed to various cooperating agencies.

"The river discharge data (Possum Kingdom Dam) for the water year ending September 30, 1949, were received during the last week of June. Considerable time was spent in computing and completing summary data that will be used for the annual progress silt report for the water year ending September 30, 1949. It is planned to complete this report during the month of July. It will be multilithed."

Evaporation Studies - D. W. Bloodgood, Austin, Texas.-"The evaporation losses and coefficients to apply for three types of evaporation pans for March, April, and May 1950, are shown in table 1 appearing on the next page.

"A coefficient of 1.00, or unity, is the real evaporation from a free water surface. The Bureau of Plant Industry (also Texas Agricultural Experiment Station) and Division of Irrigation pans give results approaching unity. The evaporation losses from the Weather Bureau pan are about 23 percent higher than the actual evaporation losses from a lake or free water surface."

Irrigation Studies - Byron Tomlinson, Laramie, Wyoming.-"Most of the month was spent installing two division boxes complete with Parshall flume measuring devices and surface pipe leads for main supply ditch. The following grass hay mixtures which were seeded during the latter part of May are: These mixtures were seeded at random on 30 of the plowed plots next to the existing native meadow plots in the experiment.

Mixture A

Brome (Lincoln)	9#/acre
Alsike Clover	3# "
Alfalfa (Ladak)	3# "

Table 1.--Evaporation losses and coefficients to apply for Weather Bureau, Bureau of Plant Industry, and Division of Irrigation Pans, March, April, and May 1950

Station	Month	Mean temperature Max.	Mean temperature Min.	Temperature Range	Precipitation	Wind movement	Evaporation losses: Weather Bureau pan (WB)[1]	Evaporation losses: Bureau of Plant Indus. pan (BPI)[2]	Evaporation losses: Div. of Irrig. pan (DI) (3)	Coefficient for conversion of evaporation from: WB pan to evap. from DI pan	Coefficient for conversion of evaporation from: WB pan to evap. from BPI pan	Coefficient for conversion of evaporation from: DI pan to evap. from BPI pan
		Deg. F	Deg. F.	Deg. F.	Inches	Miles	Inches	Inches	Inches	Ratio	Ratio	Ratio
Buchanan Dam	March	72	44	29 to 90	0.37	2,722	6.39	5.30	5.09	0.80	0.83	0.96
	April	76	54	41 to 91	2.53	2,419	6.19	4.78	4.34	.70	.77	.91
	May	86	64	58 to 95	3.25	1,972	7.16	5.80	5.19	.72	.81	.89
Totals							19.74	15.88	14.62	.74	.80	.92
Marshall Ford Dam	March	71	50	27 to 89	0.43	2,744	6.01		5.50	.92	--	--
	April	70	54	41 to 85	6.30	2,493	5.26		4.07	.77	—	--
	May	86	63	56 to 96	2.14	2,182	7.27		5.65	.78	--	--
Totals							18.54		15.22	.82		
Wm. Harris Reservoir	March	71	53	36 to 89	0.76	3,195	5.04	4.54	4.27	.85	.90	.94
	April	75	60	47 to 83	4.39	2,866	5.84	4.29	4.45	.76	.73	1.04
	May	86	70	62 to 93	1.85	--	7.36	6.13	5.33	.72	.83	.87
Totals							18.24	14.96	14.05	.77	.82	.94

[1]Surface pan - 10" high by 48" diameter.

[2]Ground pan - 24" deep by 72" diameter.

[3]Ground pan - 36" deep by 24" diameter.

Mixture B

Brome (Lincoln)	3#/acre
Orchard	4# "
Meadow Fescue	2# "
Tall Oat	3# "
Perennial Rye	2# "
Red Clover	2# "
Alsike Clover	3# "
Birdsfoot Trefoil	2# "
Alfalfa (Ladak)	2# "

"The following species and mixtures were also seeded at the rates indicated in the plowed areas between the main irrigation plots:

Rate of Seeding on Pinedale Meadow Plots

"The following species and mixtures were replicated three times.

Species:	
Smooth Brome - Common	15#/acre
Lincoln	15# "
Manchar	15# "
Orchard	15# "
Timothy	10# "
Tall Oat	15# "
Alta Fescue	15# "
Tall Wheatgrass	15# "
Intermediate Wheatgrass	15# "
Primar Slender Wheatgrass	15# "
Meadow Foxtail	15# "
Reed Canary	15# "
Alsike Clover	6# "
Red Clover	6# "
Ladino Clover	6# "
Alfalfa - Ranger	6# "
Ladak	6# "
Birdsfoot Trefoil - Broadleaf	6# "
Mixtures: - Brome-Alfalfa-Alsike	9-3-3#/acre
Timothy-Red Top-Alsike	3-3-3# "
Tall Wheatgrass-Alsike	9-5 "
Intermediate Wheatgrass-Alsike	9-5 "
Orchard-Alsike	9-5 "
Alta Fescue-Alsike	9-5 "
Primar Wheatgrass-Alsike	9-5 "
Lincoln Brome-Birdsfoot Trefoil	9-5 "
Utah Mixture*	
Mixture B	
Brome-Timothy-Alsike	5-4-5 "
Brome-Orchard-Alsike	5-5-5 "
Common Brome-Alsike-Alfalfa (Ranger)	8-3-3#/acre
Manchar Brome-Alsike-Alfalfa (Ranger)	8-3-3 "

*Utah Mixture - Tall Oat 5#, Reed Canary 4#, Timothy 4#, Alsike 3#, Strawberry 2#"

Irrigation Studies - H. B. Peterson, Phoenix, Arizona.-"Uhland core samples were taken in the bottom of a cotton furrow and at 45 degrees to the bottom of the furrow into the side. The soil type was a Laveen Sandy Loam. The infiltration rate at 45 degrees to the bed of the furrow was 0.23 inch per hour while at the bottom of the furrow it was 0.12 inch per hour.

"On another cotton field with a Laveen Sandy Loam soil there appeared to be tire tracks through the field at right angles to the furrow. Upon investigation it was found that fertilizer trucks had crossed the field there. The following picture is of tow cotton plants, onetaken from the tracked area (notice cramped roots) and the other from the undistrubed area (notice long tap root).

"Pentrometer readings and Uhland core samples were taken in the tracked area and the adjacent area of good growth. The following are the results:

	Area of cramped roots	Area of straight tap roots
Pentrometer readings	20.8	50.0
Infiltration rate--inches per hour	1.244	3.508
Percent large pore space	13.9	19.7
Apparent specific gravity	1.65	1.43
Percent total pore space	36.2	44.3

"Infiltration tests were run on a Mohave Sandy Loam soil in Deer Valley planted to cotton. The following is a comparison made of infiltration rates determined just prior to pre-irrigation and also after three irrigations, four cultivations, and one fertilization:

Cultural treatments	Infiltration rate Inches per Hour	
	Surface Foot	12" below surface
After deep plowing before pre-irrigating	1.476	4,068
After three irrigations 4 cultivations and one fertilization	0.226	0.425

"Infiltration tests were determined on a silt loam field at Stanfield. The following are the results after various cultural treatments:

Cultural practices	Infiltration rates Inches per Hour		
	Furrow bottom		Plant bed
	Surface	12 below	surface
Deep plow 18-24". Land planned twice and furrow out.	Too fast to measure with a cylinder, it took about 60 seconds for 62 of water to enter the soil.		
Plus listed above; pre-irrigate, disk, harrow, planted, cultivated, fertilized, irrigated, cultivated	0.080	1.238	0.274

7/27/34.

Irrigation Studies - Karl Harris, Phoenix, Arizona.-"One trip was made to the Northern part of the State where I went over the irrigation district at Fredonia with two members of the Soil Conservation District Board.

"A talk to 30 veterans was made at Flagstaff on Preparation of Land for Irrigation. Soil samples were collected and percolation rates determined on tillage experiment at Safford. The yield data were determined on plots. The following table shows results:

Table 1.--Soil reclamation test Safford farm weight threshed barley in pounds per acre

Irrigated river water	Irrigated well water	2 tons Gypsum per acre	No Gypsum used	Rough tillage	Smooth tillage
	3100 PPM				
4903	4884	5964	4903	5318	4903
5583	5904	5082	5583	3640	5583
5964	5269	4922	5318	4922	5964
5082	5142	3898	3640	3898	5082
5318	5336	5269	4884	5336	4884
3640	5575	5142	5904	5575	5904
4922	4794	4794	5336	4794	5269
3898	6349	6349	5575	6349	5142
Ave. 4911	5407	5178	5143	4979	5381

"It will be seen that plots there were irrigated all season with water containing 3100 P. P. M. total salts yielded as much grain as the plots being irrigated with river water with low salt content.

"The plots receiving 2 tons gypsum per acre did not yield any more grain than those receiving no gypsum.

"With the exception of two plots at the north end of the field, the rough tillage (that is, no work done on seedbed preparation other than plowing) yield just as well as the plots receiving $6.00 work per acre. On plots 16 and 17 at the north end of the experiment, the lower yield on these plots was probably due to some other cause."

7/27/50